

Listing of the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Canceled)
2. (Original) An acoustic feedback cancellation apparatus, comprising:
an analysis filter bank operable to divide a digital audio signal into a plurality of digital subband signals;
a plurality of subtractors configured to subtract a plurality of estimated feedback subband signals from the plurality of digital subband signals to provide a plurality of digital error subband signals;
a plurality of digital signal processors configured to receive the plurality of digital error subband signals and provide a plurality of processed digital subband signals;
a synthesis filter bank configured to combine the plurality of processed digital subband signals and provide a processed wideband digital audio signal; and
an acoustic feedback cancellation loop coupled between the synthesis filter bank and the plurality of subtractors, said acoustic feedback cancellation loop comprising a plurality of cascaded training and a tracking filters operable to produce the plurality of estimated feedback subband signals.
3. (Original) The acoustic cancellation feedback apparatus of claim 2, further comprising a plurality of switches coupled between the plurality of digital error subband

signals and the plurality of cascaded training and tracking filters, said plurality of switches operable to configure the acoustic cancellation feedback apparatus in either a training mode or a tracking mode.

4. (Original) The acoustic feedback cancellation apparatus of claim 2 wherein each of said training filters comprises a Finite Impulse Response (FIR) filter.

5. (Original) The acoustic feedback cancellation apparatus of claim 2 wherein each of said training filters comprises an Infinite Impulse Response (IIR) filter and each of said tracking filters comprises a Finite Impulse Response (FIR) filter.

6. (Original) The acoustic feedback cancellation apparatus of claim 2 wherein each digital signal processor comprises a noise reduction and hearing-loss compensation apparatus.

7. (Original) An acoustic feedback cancellation apparatus, comprising:
an analysis filter bank operable to divide a digital audio signal into a plurality of digital subband signals;
a plurality of subtractors configured to subtract a plurality of estimated feedback subband signals from the plurality of digital subband signals to provide a plurality of digital error subband signals;

a plurality of digital signal processors configured to receive the plurality of digital error subband signals and provide a plurality of processed digital subband signals;

a synthesis filter bank selectively coupled to the plurality of digital signal processors,

said synthesis filter bank operable to combine the plurality of processed digital subband signals and provide a processed wideband digital audio signal; and

an acoustic feedback cancellation loop selectively coupled between outputs of the plurality of digital signal processors and the plurality of subtractors, said acoustic feedback cancellation loop comprising a plurality of cascaded training and a tracking filters operable to produce the plurality of estimated feedback subband signals.

8. (Original) The acoustic cancellation feedback apparatus of claim 7, further comprising a plurality of switches coupled between the plurality of digital error subband signals and the plurality of cascaded training and tracking filters, said plurality of switches operable to configure the acoustic cancellation feedback apparatus in either a training mode or a tracking mode.

9. (Original) The acoustic feedback cancellation apparatus of claim 7 wherein each of said training filters comprises a Finite Impulse Response (FIR) filter.

10. (Original) The acoustic feedback cancellation apparatus of claim 7 wherein each of said training filters comprises an Infinite Impulse Response (IIR) filter and each of said tracking filters comprises a Finite Impulse Response (FIR) filter.

11. (Original) The acoustic feedback cancellation apparatus of claim 7 wherein each digital signal processor comprises a noise reduction and hearing-loss compensation apparatus.

12. (Original) An acoustic feedback cancellation apparatus, comprising:

an analog-to-digital converter (ADC) configured to receive an analog audio signal and convert it to a digital audio signal;

a subtractor configured to subtract a synthesized estimated feedback signal from the digital audio signal to provide a synthesized digital error signal;

a digital signal processor configured to receive the synthesized digital error signal and provide a processed wideband digital audio signal;

a first analysis filter bank configured to receive the synthesized digital error signal and provide a plurality of digital error subband signals; and

an acoustic feedback cancellation loop comprising:

a second analysis filter bank configured to selectively receive the processed wideband digital audio signal and provide a plurality of feedback subband signals,

a plurality of cascaded training and tracking filters configured to receive the plurality of feedback subband signals, and

a synthesis filter bank configured to receive the filtered feedback subband signals and provide the synthesized digital error signal.

13. (Original) The acoustic cancellation feedback apparatus of claim 12, further comprising a plurality of switches coupled between the plurality of digital error subband signals and the plurality of cascaded training and tracking filters, said plurality of switches operable to configure the acoustic cancellation feedback apparatus in either a training mode or a tracking mode.

14. (Original) The acoustic feedback cancellation apparatus of claim 12 wherein each of said training filters comprises a Finite Impulse Response (FIR) filter.

15. (Original) The acoustic feedback cancellation apparatus of claim 12 wherein each of said training filters comprises an Infinite Impulse Response (IIR) filter and each of said tracking filters comprises a Finite Impulse Response (FIR) filter.

16. (Original) The acoustic feedback cancellation apparatus of claim 12 wherein each digital signal processor comprises a noise reduction and hearing-loss compensation apparatus.

17. (Original) An acoustic feedback cancellation apparatus, comprising:

- a first subtractor configured to selectively subtract a digital audio signal from an estimated training feedback signal;
- a first analysis filter bank operable to divide an output signal from the first subtractor into a plurality of subband signals;
- a plurality of second subtractors configured to subtract a plurality of estimated feedback subband signals from the plurality of subband signals to provide a plurality of digital error subband signals;
- a plurality of digital signal processors configured to receive the plurality of digital error subband signals and provide a plurality of processed digital subband signals;
- a synthesis filter bank coupled to the plurality of digital signal processors, said synthesis filter bank operable to combine the plurality of processed digital subband signals and provide a processed wideband digital audio signal; and

an acoustic feedback cancellation loop comprising:

 a training filter configured to selectively receive the processed wideband digital audio signal,

 a second analysis filter bank configured to selectively receive the filtered processed wideband digital audio signal from the training filter to provide a filtered plurality of feedback subband signals, and

 a plurality of tracking filters configured to receive the filtered plurality of feedback subband signals and provide the plurality of estimated feedback subband signals.

18. (Original) The acoustic cancellation feedback apparatus of claim 7, further comprising a plurality of switches coupled between the plurality of digital error subband signals and the plurality of tracking filters, said plurality of switches operable to configure the acoustic cancellation feedback apparatus in either a training mode or a tracking mode.

19. (Original) The acoustic feedback cancellation apparatus of claim 17 wherein each of said training filters comprises a Finite Impulse Response (FIR) filter.

20. (Original) The acoustic feedback cancellation apparatus of claim 17 wherein each of said training filters comprises an Infinite Impulse Response (IIR) filter and each of said tracking filters comprises a Finite Impulse Response (FIR) filter.

21. (Original) The acoustic feedback cancellation apparatus of claim 17 wherein each digital signal processor comprises noise reduction and hearing-loss compensation apparatus.

22. (Original) An acoustic feedback cancellation apparatus, comprising:

a first analysis filter bank configured to receive a digital audio signal and provide a plurality of digital subband signals;

a plurality of first subtractors configured to subtract a first plurality of estimated feedback subband signals from the plurality of digital subband signals to provide a plurality of digital error subband signals;

a plurality of digital signal processors configured to receive the plurality of digital error subband signals and provide a plurality of processed digital subband signals;

a synthesis filter bank coupled to the plurality of digital signal processors, said synthesis filter bank operable to combine the plurality of processed digital subband signals and provide a processed wideband digital audio signal;

a plurality of averagers configured to average each of the plurality of digital subband signals to provide a plurality of averaged digital subband signals;

a plurality of second subtractors configured to subtract a second plurality of estimated feedback subband signals from each of the averaged digital subband signals; and

an acoustic feedback cancellation loop comprising:

a second analysis filter bank coupled to the processed wideband digital audio signal operable to provide a first plurality of processed feedback subband signals,

a plurality of cascaded training and a tracking filters configured to receive the first plurality of processed feedback subband signals and provide the plurality of estimated feedback subband signals, and

a third analysis filter bank coupled to a second plurality of training filters, said second plurality of training filters providing the second plurality of estimated feedback subband signals

23. (Original) An apparatus for canceling acoustic feedback in hearing aids, comprising:

means for digitizing an input audio signal into a sequence of digital audio samples;

means for dividing said sequence of digital audio samples into a plurality of subband signals;

means for processing each of said plurality of subband signals separately into a plurality of processed digital subband audio signals using a noise reduction and hearing loss compensation algorithm;

means for combining said plurality of processed digital subband audio signals into a processed wideband digital audio signal;

means for converting said processed wideband digital audio signal into an output audio signal;

training filter means for filtering each of said plurality of subband feedback signals, said training filter means operable to model the static portion of the feedback path in each of said subbands;

tracking filter means for filtering output signals of said training filter means, said tracking filter means operable to track variations of the feedback path in each of said subbands; and

means for subtracting output signals of said tracking filter means from corresponding subband signals of said plurality of subband signals.